morphological properties of the stenosis and the vasoreactivity of the microvasculature in the supplied myocardial territory. The aim of the this study was the analysis of the relation between the measured FFR values and pressure gradients calculated by fluid dynamic equations, based on morphological and contrast flow data obtained from 3D reconstruction of the stenosis.
Methods: FFR measurements were performed on 26 coronary artery segments of 22 patients. After 3D reconstruction of the same segments carried out with the IC3D software on the Axiom Artis (Siemens) X-ray machine, the following parameters of the stenosis were determined: the cross-sectional area stenosis (AS), the length of the stenosis (L), the minimum lumen area (MLA), the plaque volume (PV) and the distalis reference area (dRef A). The coronary artery volumetric flow was calculated under vasodilatation, based on the flow velocity, determined using the distance traveled by the contrast material (reconstructed in 3D) per unit time, and the various parameters listed above; then the pressure gradient was determined by the fluid dynamic equations: dP= Q(Rp+QRt), where Rp= 0.75*L / MLA2 and Rt= 3.76* (1/MLA − 1/dRef A)2, Q(volumetric flow)(ml/s) = flow velocity * dRefA.
Results: Regression analysis demonstrated strongly significant relationship between the measured and the calculated FFR (r=0.85; p= 0.0004. The AS (r=−0.63; p=0.005), the PV (r=−0.60; p=0,001) and the MLA (r=0.50; p=0.009) showed weaker relationship with the measured FFR.
Conclusions: Although statistical correlation can be demonstrated between the morphological parameters calculated by 3D coronary angiography and the measured FFR values, taking into account the flow data is necessary to facilitate a more precise prediction of FFR.

TCT-235

Accuracy of 320 computed tomography coronary angiography in detection of functionally significant stenoses - comparison with FFR.

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Background: Fractional flow reserve assessment (FFR) may identify functionally significant coronary lesions which may benefit from revascularisation. It is predominantly performed upon identification of ≥50% stenosis on invasive angiography (ICA). The accuracy of 320-detector computed tomography coronary angiography (CTA) in detection of FFR-significant stenoses and its role in determining vessels which may benefit from FFR assessment is not known. We sought to determine and compare the diagnostic accuracy of 320-detector CTA and ICA in detection of functionally significant coronary stenoses using FFR as the reference standard.
Methods: We investigated 78 patients with stable angina who underwent 320-detector CT, ICA and FFR assessment in 2010-12. CTA and quantitative coronary angiography (QCA) were performed to determine the stenosis severity and compared with FFR measurements. A significant anatomical or functional stenosis was defined as ≥50% diameter stenosis or an FFR ≤0.8.
Results: A total of 156 vessels were evaluated of which 58 (37%) had an FFR≤0.8. CTA detected FFR-significant stenosis with a 91% sensitivity, 67% specificity, 55% positive predictive value (PPV) and 93% negative predictive value (NPV). In the presence of severe calcification, the corresponding values were 96%, 23%, 72% and 75%. QCA detected FFR-significant stenosis with a 67% sensitivity, 76% specificity, 63% PPV and 80% NPV. Overall accuracy was comparable (CTA 76% vs QCA 73%). On receiver operating characteristic analysis, the area under the curve for CTA and QCA in predicting FFR ≤0.8 was 0.78 and 0.72 respectively.
Conclusions: Compared with invasive angiography, 320-CT coronary angiography detects and excludes FFR-significant stenoses with a higher sensitivity and negative predictive value, which are both in excess of 91%. CT angiography may be a superior gatekeeper than invasive angiography in determining coronary vessels which may benefit from functional assessment using fractional flow reserve.

TCT-236

The Diastolic Wave-Free Period Is The Most Suitable Period In The Cardiac Cycle For The Assessment Of A Coronary Stenosis: Implications For The Accurate Calculation Of The Instantaneous Wave-Free Ratio (iFR)

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Background: The instantaneous wave-free ratio (iFR) is a new vasodilator free pressure-only index of coronary stenosis severity calculated during the diastolic wave-free period. In this study we differentiate the haemodynamics of the wave-free period from the rest of the cardiac cycle to investigate whether identification of the wave-free window is critical for the accurate pressure only assessment of a coronary stenosis.
Methods: Pressure and flow velocity was measured in 39 vessels distal to a coronary stenosis at rest. Mean flow velocity and Pd/Pa ratio was calculated during 5% cumulative intervals over the complete cardiac cycle and then during 5% cumulative intervals during diastole.
Results: The diastolic wave-free period provided the highest intracoronary flow velocity (flow velocity 28.8±3cm/s wave-free period vs. 26.8±3cm/s diastole and 21.2±2cm/s complete cardiac cycle, p<0.001 for both). The wave-free period consistently provided the lowest Pd/Pa ratio (0.85±0.02 vs 0.87±0.02 diastole and 0.93±0.03 complete cardiac cycle, p=0.01 and p<0.001 respectively).
Conclusions: When identified precisely, the diastolic wave-free period consistently provides the highest intra-coronary flow and therefore lowest microvascular resistance when compared with the raw cardiac cycle or even simply the whole of diastole. This highlights the importance of accurately isolating the wave-free period when calculating iFR.

TCT-237

Fractional Flow Reserve versus Angiographic Guidance of Percutaneous Coronary Intervention: A Systematic Review and Meta-Analysis

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Background: Integrated evidence is unavailable concerning the possible clinical benefits of FFR-guided PCI. A meta-analysis using currently available data was performed to compare fractional flow reserve (FFR)-guided PCI to conventional coronary angiography-guided percutaneous coronary intervention (PCI).
Methods: The meta-analysis included 2,584 patients from 1 randomized and 5 observational studies, with 1,283 patients in the FFR-guided PCI group and 1,301 patients in the angiography-guided PCI group. Major adverse cardiovascular events were defined as the composite of death, myocardial infarction (MI) or target vessel revascularization (TVR).
Results: FFR-guided PCI was significantly associated with a decreased use of stent implantation. The mean difference of the number of stents used was -0.88 (95% confidence interval [CI] −1.37 to −0.39, p ≤ 0.001). FFR-guided PCI was associated with a significantly lower risk of the composite of death or MI (odds ratio [OR] 0.49, 95% CI 0.33 to 0.72, p < 0.001), MI (OR 0.33, 95% CI 0.14 to 0.73, p = 0.004), TVR (OR 0.66, 95% CI 0.48 to 0.89, p <0.001), and MACE (OR 0.55, 95% CI 0.38 to 0.79, p = 0.001). No significant difference was seen for mortality (OR 0.71, 95% CI 0.44 to 1.15, p = 0.12).
Conclusions: FFR-guided PCI was associated with lower risks of MI, TVR, and MACE, but not mortality. The observed clinical benefit was achieved through the reduced use of stent implantation.

TCT-238

The Instantaneous Wave-Free Ratio (iFR) and Fractional Flow Reserve (FFR) Have Equivalent Diagnostic Categorisation When Compared To Flow Based Indices

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Background: The instantaneous wave-free ratio (iFR) is a vasodilator-free pressure-only index of coronary stenosis severity comparable to fractional flow reserve (FFR) in diagnostic categorisation. When iFR and FFR disagree in treatment classification it has not been established which index most accurately represents the significance of the stenosis. In this study we use the pressure and flow based index of hyperaemic stenosis resistance (HSR) to act as an arbiter to determine if iFR or FFR most accurately represents the haemodynamic significance of the stenosis. HSR has been demonstrated to be more predictive of ischaemia than FFR.
Methods: In 51 vessels intra-coronary pressure and flow velocity was measured distal to the stenosis at rest and during adenosine mediated hyperaemia. iFR, FFR, and HSR were calculated using fully-automated algorithms.
Results: iFR had excellent agreement with FFR (ROC AUC 93%). When iFR and FFR disagreed (4 cases, 7.7% of the study population) HSR agreed with iFR in 50% of cases and with FFR in 50% of cases. Over the entire patient population iFR and FFR had equivalent agreement with HSR treatment categorisation (ROC AUC iFR 0.93 vs FFR 0.96, p=0.38). In the FFR 0.6-0.9 stenosis range iFR and FFR had also equivalent diagnostic agreement with HSR stenosis classification (87.5%).